LOW PRESSURE FUEL EVAPORATIVE TESTER (LPFET)

SPECIFICATION

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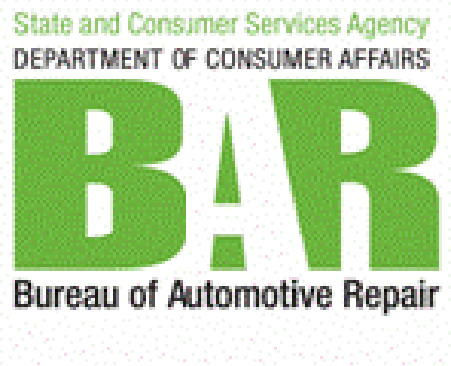
Revision F



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1. SCOPE

The Smog Check program is designed to reduce emissions from mobile sources in California. These mobile source emissions include hydrocarbon vapors escaping from automotive fuel tanks and fuel evaporative systems. Consequently, the Bureau of Automotive Repair (BAR) needs a device capable of pressure-testing fuel evaporative systems as a component of the Smog Check inspection in approximately 8,500 Smog Check inspection stations on all 1995 and older model year vehicles.

This specification covers the Low-Pressure Fuel Evaporative Tester ("tester") performance requirements and certification procedures used by BAR to determine compliance with this specification. In this specification, the words "shall" and "required" denote that the associated requirement is mandatory. The words "should" and "desired" denote that the associated requirement is an objective. Failure to meet an objective must be fully substantiated.

2. GENERAL REQUIREMENTS

2.1. BAR requires a stand-alone tester capable of testing 95% of the automotive fuel evaporative systems in California's 1976 – 1995 model year vehicle fleet, subject to the Smog Check program. In addition, the tester shall be capable of integration with California's BAR-97 Revised Emission Inspection Systems (EIS). The tester shall make accurate pass/fail determinations for typical gasoline blends and ages, temperature, and tank fill levels. A "FAIL" result shall be displayed if the leak exceeds the orifice size listed in the active record in the PRESSCONFIG.DAT file (Section 12). Furthermore, the tester shall use menu driven software. In addition, all tester components exposed to fuel, including, hoses, connectors, etc., shall be made of fuel resistant materials. The tester shall be equipped with an internal or external modem to accommodate communications with the manufacturer's database. The tester shall also include a minimum of ten foot RJ-11 phone cord and an RJ-11 "T" for connecting two phones lines to one jack. Finally, the tester shall be capable of pressurizing the fuel tank in a manual mode to accommodate fuel evaporative system leak diagnosis and repairs.

2.2. The test protocol shall consist of sealing the vapor hose by means of pinch pliers as close to the charcoal canister as possible. If the hose is inaccessible using pinch pliers, then other means such as plugs may be used on the end of the vapor hose.

2.3. The manufacturers shall supply BAR with the communications software required to communicate with the Low Pressure Fuel Evaporative Tester in the Q/A software using RS-232 communications protocol. In addition, the software shall be compatible with the Windows 2000 operating system, or equivalent windows operating system upgrade and comply with the requirements set forth in Sections 3.6 and 4.10 of this specification. The tester may have a USB connection. Manufacturers shall demonstrate USB cable connectivity to a laptop computer, in anticipation of future USB integration with a future BAR EIS.

2.4. The Reid Vapor Pressure and fuel variation compensation shall be based on the tester manufacturer's methodology.

2.5. The manufacturer shall provide written certification to BAR that the tester and all accessories submitted for evaluation and subsequent certification are fully compliant with these specifications.

2.6. The tester may use either nitrogen or compressed air to pressurize the vehicle's fuel tank; in either case, hardware shall be provided with the tester to prevent particulate contamination.

2.7. When the LPFET is integrated with the BAR-97 EIS, the LPFET will retain all stand-alone functionality. The LPFET shall have the ability to be disconnected from the EIS, perform a low-pressure fuel evaporative test, reconnect to the EIS and upload a test record when prompted by the EIS. Furthermore the LPFET shall retain the ability to be used in manual mode as a diagnostic tool either in stand alone or integrated modes.

3. PERFORMANCE SPECIFICATIONS

3.1. TESTER FUNCTIONS

3.1.1. Flow Rate – The tank fill flow rate shall not exceed 20 liters per minute (LPM).

3.1.2. Pressure Measurement – The tester shall measure fuel tank pressures ranging from 0" - 34" H_2O gauge.

3.1.3. Pressurization Detection – The tester shall be capable of detecting an over/under pressure condition for either the incoming supply pressure or the regulated test pressure.

3.1.3.1. The tester shall prevent operation when inlet pressures are less than 25psi or greater than 35psi. In order to allow manual regulator adjustment, the tester shall display the Current Inlet Pressure on the Status Page (Section 4.9).

3.1.3.2. If at anytime the tester is connected to the vehicle's tank and the fuel tank pressure exceeds 28" H_2O gauge, as measured by the tester, the tester shall immediately disable the air or nitrogen inlet valve and vent to prevent exceeding 28" H_2O gauge. The software shall prevent the tester from performing either a Fuel Evaporative Test or Manual Mode pressurization of the fuel tank until the problem has been corrected. During certification testing, BAR shall confirm the tester has a functional overpressure mechanism capable of repeatedly relieving tank pressures exceeding 28" H_2O.

3.1.3.3. The tester shall have a mechanical "fail safe" vent valve that vents the fuel tank when the pressure is greater than 83" H_2O gauge. This valve shall reset automatically.

3.1.4. Pressure Vent – At the conclusion of the test: the technician shall be prompted to remove the "pinch-off" pliers or plug from the fuel vapor hose before removal of the tester hose and fuel tank filler neck adapter.

3.1.5. 3-Day Calibration – The tester shall require a calibration and leak check every 72 hours.

3.1.6. Manual Mode Testing – The tester shall have a manual mode to pressurize the fuel tank no greater than 20" H2O to allow diagnosis and repair. An 80db or louder (measured 6' away and directly in line) device shall turn on when manual mode is activated. The sound shall change tone or interval as the leak size changes. Upon exiting manual mode, the tester shall vent the tank pressure prior to prompting for disconnecting the filler neck adaptor.

3.1.7. Display – The tester shall display all menus, prompts, and where necessary, instructions on a graphic capable display of a minimum of 2" x 3" inches, or on at least 16 characters by 2 lines liquid crystal display (16 x 2 LCD) that should scroll information when the prompt or message exceeds the 32 characters.

3.1.7.1. Readability – The display shall be readable from a minimum distance of 3 feet in a building that meets OSHA lighting standards for a garage environment. Display contrast and brightness may be adjustable and the display may be backlit.

3.1.7.2. Testing Messages – During the test, the tester shall display the word TESTING on the screen. The tester shall also display messages, if applicable, such as failed to pressurize, excessive pressure, etc. At no time during the test may the display indicate the test result until the test has completed the testing procedure.

3.1.7.3. Information Not Permitted During Testing - The tester shall not display any reading relative to the fuel evaporative test while performing the automated test cycle. However, in the manual mode, the tester may display any reading deemed appropriate by the manufacturer.

3.1.8. Internal Clock – The tester shall be equipped with an internal clock capable of automatically switching between daylight savings time and Pacific Standard Time and shall account for leap years. The clock shall be correctable on command from either EIS or by a laptop in Q/A mode. During every data upload, the Data Depot (Section 8) shall download the current date and time to the tester. The tester shall update the date and time after receiving the current date and time from the Data Depot. The clock shall have a battery backup feature. The Data Depot shall contact NIST (http://www.bldrdoc.gov/timefreq/index.html) and synchronize its time daily.

While synchronizing the clock during the data upload; if the time is off by more than 20 seconds per day, (Example: over 600 seconds for 30 days, over 140 seconds for 7 days) the tester shall be required to upload at a frequency of 4 times the normal frequency until the tester can be serviced. If the tester's clock is within 20 seconds, total time, upon the next call to the Data Depot, the tester shall return to normal dialup frequency.

3.2. TESTER ACCURACY

3.2.1. Air / Nitrogen Added – During the first pressurization of the test sequence, the tester shall record the number of gallons of air or Nitrogen required to pressurize the tank from ambient pressure to initial target pressure (between 14 and 20 inches H_2O.) This reading shall be corrected to standard temperature and pressure (21 degrees C and 1 ATM) before entering into the test record.

3.2.2. Apparent Volume –This shall be the estimated vapor space size in gallons during a test. The maximum apparent tank size that the tester is required to quantify is 50 gallons. The result shall be corrected to standard temperature and pressure (0 degrees C and 1 ATM), and shall include fuel vapor and leak compensation. Where unable to pressurize, the appropriate data fields shall be filled with 9's; e.g. (999.9).

3.2.3. Pressure Measurement – The tester shall measure inlet pressures of 0 – 35 PSI within ± 2% of full scale and internal tester pressures of 0" – 34" H_2O ± 2% of full scale.

3.2.4. Pass/Fail Determination – The tester shall make a pass/fail determination based on the PRESSCONFIG.DAT decision point. This orifice size shall be adjustable by BAR over a range of 0.020 to 0.050 inches diameter in 0.001 inch increments. The tester shall switch to the appropriate decision point per the corresponding start date. Dates and decision points shall be adjustable and uploaded from the Data Depot (Section 8) to the tester, by either the equipment manufacturer or BAR. The tester shall display and record leak size from 0.015 to the point where the tester is unable to pressurize the vehicle tank. For measured leaks less than 0.015 the tester shall fill the appropriate data fields with 1's; e.g. ".000" and display "<0.015".

3.2.5. Decision Accuracy shall be determined using the Accuracy equation:

$$\text{Accuracy} = 0.09 \cdot (\text{Actual Leak}) + 2.43 \cdot (\text{Actual Leak})^{2}$$

or +/- 0.004 inch orifice, whichever is greater (leak is in inches). These limits do not apply where unable to pressurize as in the case of a gross leak. This accuracy range applies over a tester inlet pressure range of 25psi through 35psi.

3.2.6. Uncompensated hole – The tester shall record the measured hole size before any fuel vapor compensation calculations are applied.

3.3. REPEATABILITY

3.3.1. Decision Repeatability shall be 50% of the Decision Accuracy. Using the Accuracy equation in Section 3.2.5 or +/- 0.004 inch orifice, whichever is greater (leak in inches). Given an actual leak of 0.040 the accuracy is +/- 0.0075 inch, totaling 0.015-inch range. Thus, the repeatability over 5 sequential tests shall be within 0.0075-inch difference of the highest and lowest tester decisions. Repeatability is limited to fixed volume, dry air, and uniform temperature.

3.4. TESTER CALIBRATION

3.4.1. The tester shall leak check the tester to tank hose, connectors, calibration orifice standard, and calibration tank. The 2-gallon calibration tank shall be used to confirm the tester's vapor space calculation. The 2-gallon calibration tank with 0.020 and 0.040 orifice standards shall be used to confirm factory calibration.

3.4.2. An internal clock shall determine when the calibration is due. The tester shall be programmed to automatically lock out the test procedure every 72 hours pending a successful completion of the calibration procedure.

3.4.3. If the tester fails any portion of the calibration, the technician will be prompted to perform subsequent calibration procedures or contact service for repairs.

3.4.4. Upon failing the calibration procedure, the tester shall prevent any testing with the device but shall allow subsequent attempts to successfully complete the 3-day calibration procedure. Once the calibration has been successfully completed, the software shall allow testing to resume. If the number of consecutive calibration attempts without a pass exceeds "Allowed calibrations before lockout" in PRESSCONFIG.DAT, then the analyzer shall lock out for service.

3.4.5. Anytime service of the tester is required, the tester shall not allow further tank testing or manual mode pressurization to be performed until full function has been restored by service from the manufacturer or its authorized representative.

3.4.6. The tester calibration routine shall include a factory calibration drift check, using both the 0.020" and the 0.040" standards for any pass/fail decision point.

3.5. TESTER FUNCTIONALITY

3.5.1. The tester shall be simple and easy to use and shall complete the low-pressure test in no more than six minutes for vapor volumes up to 25 gallons and no more than 10 minutes for fuel tanks where the vapor volume exceeds 25 gallons.

If an average test time of less than 4 minutes with an apparent leak size of 0.030 inches or less, can be obtained, BAR will allow the completion of the test with only the PASS decision being determined. Reporting of "Apparent Leak Size" will not be required. Accuracy of the PASS decision must be maintained and this method is subject to BAR approval and certification testing. Data reporting requirements will remain for FAIL tests.

3.5.2. The tester shall be equipped with at least 12-button keypad that includes 10 numeric keys to accommodate the following functions.

3.6. TESTER COMMUNICATIONS AND SOFTWARE

3.6.1. Software – All source code shall use C/C++ (.NET or not), or C#, VB using the Microsoft® .NET environment, to operate the tester and all components. No other software languages shall be used without express written permission from BAR.

3.6.2. Communications – Standard RS-232 communications protocols shall be used for communication between the EIS and the tester. The tester shall be equipped with a modem capable of receiving updates to the software and changes the PASS/FAIL criteria as required by BAR. In addition, a laptop computer using RS-232 communications shall be used for all software and table updates for the tester. Communications protocols are further explained in Section 4.

3.6.3. The communications protocol shall allow:

- Software updates as deemed necessary by BAR.
- Table updates required for the PASS/FAIL standards.
- Test data uploads.
- Calibration record uploads.
- EIS communication.

3.6.4. The tester shall be equipped with a telephone modem capable of receiving call and data as required in Section 2.1.

3.7. TESTER OPERATING CONDITIONS

3.7.1. Temperature - The tester shall operate within specifications at ambient temperatures that range from 20 – 120 degrees F.

3.7.2. Humidity - The tester shall operate within specifications at relative humidity ranging from 5 – 95%, and shall be resistant to water spray.

3.7.3. Tester Housing

- The tester housing shall be resistant to automotive shop chemicals.
- Tamper-resistant fasteners shall prevent unauthorized access to internal tester components.
- The tester shall continue to meet these specifications after a drop of 36” to a concrete floor.

3.7.4. Memory

3.7.4.1. Tester on-board memory shall be non-volatile and capable of storing the most recent 1,000 test results. If the tester exceeds 1,000 tests, then the software may individually overwrite previous test results beginning with the oldest test record.

Details of the Test Record are illustrated in Section 9. The data upload tester lockout (Section 4.5.2.2.1), based on configuration file setting, does not affect the tester data storage requirement; e.g., if the upload lockout is set to 500 records, the same 500 records will remain in the tester until the 1,000 record limit is exceeded, then the oldest will be replaced by the newest.

3.7.4.2. Tester on-board memory shall be capable of storing at least the most recent 50 calibration records. When the tester exceeds its capacity for calibration records, the software may individually overwrite previous test records beginning with the oldest. Details of the Calibration Record are illustrated in Section 10.

3.7.4.3. The tester on-board memory shall store one pending software update that automatically loads on the corresponding start date.

3.7.5. Safety

3.7.5.1. Fuel tank vapor shall only flow through the tester during a test or when venting is required.

3.7.5.2. Electrical connections and hoses shall be equipped with sufficient strain relief to prevent kinking and flexing damage.

3.7.5.3. The tester shall be certified by a safety laboratory such as Underwriters Laboratories Inc. (UL) or equivalent.

3.8. TESTER IDENTIFICATION

3.8.1. The tester's serial number and date of manufacture shall be displayed on the exterior of the tester for convenient inspection by quality assurance inspectors and BAR field representatives. Serial numbers shall be unique and a continuously updated list of all serial numbers manufactured or repaired will be available for BAR upon request. Tester hardware changes and updates shall be documented by the manufacturer and by the tester's serial number, including the refurbishing and or repairing of defective units.

3.8.2. The first two characters of the serial number shall be alphas denoting the manufacturer's initials, and shall not be changeable in software. The current manufacturer initials are listed below. New manufacturers shall use initials approved by BAR, on a first come first serve basis. When new initials are needed, all the manufacturer codes shall be listed in an addendum to this specification.

"ES" - Environmental Systems Products Holdings Inc. (ESP)

"SY" – SysTech International

"WA" - Waekon®

3.8.3. The remaining six characters shall be numeric and right justified. Zeroes shall fill any blank spaces between the alpha and the numeric characters. For example, the tester number #55 from Best Suppliers would be "BS000055".

3.9. ACCESSORIES

3.9.1. The low-pressure fuel evaporative tester shall include the following accessories with the initial purchase:

3.9.1.1. Two pairs of pliers/clamps capable of pinching the vapor hose to completely block vapor flow. The pliers should apply sufficient pressure to completely block any flow while also leaving the hose undamaged and serviceable. In addition, the pliers shall be lockable and capable of performing 5,000 clamping cycles. Tester equipment manufacturers shall sell the same BAR approved pliers. Pliers shall have a 3 ft. long by 1 inch wide orange flag attached to the handle.

3.9.1.2. Two sets of tapered hose plugs shall fit 1/8 to 1/2 inch I.D. hose in 1/8-inch increments. The manufacturers shall use a set of plugs manufactured by Thexton, Part Number 312 or other as approved by BAR.

3.9.1.3. A 2-gallon steel tank, Firestone Industrial Products, Part Number 9126 072403, or equivalent, shall be used as the calibration tank.

3.9.1.4. If the tester uses nitrogen as the pressurizing gas, it shall be 98% pure, with <100ppm hydrocarbons. The pressure regulator supplied with the tester purchase, shall be capable of reducing the outlet nitrogen supply line pressure to 25 – 35 psig. The manufacturer shall also provide the following:

- For Nitrogen: A particle filter(s) capable of removing harmful particles the nitrogen source line. This filter must ensure that no contaminants enter the tester that could physically block any orifice or internal components of the tester. The filter shall be capable of removing 5-micron size particles.

- For compressed Air: Filter(s) capable of removing harmful contaminants and moisture from the air source. This filter must ensure that no contaminants enter the tester that could physically block any orifice or chemically contaminate the internal components of the tester. The filter shall be capable of removing 5-micron size particles, solvent vapors and hydrocarbons.

3.9.1.5. If the tester uses compressed air as the pressurizing gas, the manufacturer shall provide the following:

- A pressure regulator capable of reducing the compressed air supply line pressure to 25 – 35 psig.

- Air filter(s) capable of removing harmful contaminants and moisture from the compressed air source. This filter must ensure that no contaminants enter the tester

that could physically block any orifice or chemically contaminate the internal components of the tester. The filter shall be capable of removing 5-micron size particles, solvent vapors and hydrocarbons.

3.9.1.6. Filler Neck Adapters – The tester shall include a set of fuel filler neck adaptors that provide connectivity to at least 95% of applicable model-year vehicles. The adaptors shall be equipped with a non-standard (atypical of shop air tool connectors) quick-disconnect device that facilitates easy and rapid connection to the tester. The adapters shall be of durable construction and capable of withstanding a drop from the height of 48" onto a concrete floor with no damage. All manufacturers shall use the same filler neck adapter color scheme. All filler neck adaptor gasket materials shall remain pliable and impermeable to all commercially available gasoline blends.

- "BLACK" – Threaded adapter.
- "BLUE" – Large cam-on adapter.
- "RED" – Small cam-on adapter.
- "ORANGE" – Bayonet adapter. (not currently required for 95% coverage)
- Universal and other colors to be decided by BAR as needed.

3.9.1.7. Instruction Manual - A complete instruction manual (proof copies acceptable) for each model unit shall be submitted. The manufacturer shall verify each step of the operating and calibrating procedure.

3.9.1.7.1. The instruction manual accompanying each tester shall contain the following minimum information:

- Fuel Evaporative System Test Procedure
- Manual Mode Procedure
- Calibration Procedure
- Explanation of Status Page
- Functional Diagrams (mechanical and electrical).
- Accessories and Options.
- Model Number and Identification Markings and Locations.
- Maintenance procedures and frequencies recommended by the manufacturer. The services that should be performed only by the manufacturer shall be clearly marked.
- Service Contract contact information. This will include a toll free phone number, mailing address, or website for further details about tester Service Contract options.

3.9.1.8. Seal Verification Check Balloon - The balloon shall be a standard small off the shelf item. The balloon will attach to the vehicle with a reusable fitting that meets the criteria outlined in 3.9.1.2.

3.10. DESIGN CONSTRAINTS

3.10.1. Hose and Hose Connections

- All supply and test hoses shall remain flexible at temperatures ranging from 20 – 120 degrees F.
- Hoses shall not be permanently deformed after being pinched between the vehicle's tire and a concrete floor, nor shall they degrade in the presence of gasoline or its constituents.
- The tester hose shall be constructed to minimize tangling in an automotive shop environment.
- External low-pressure hose assemblies shall be field replaceable only with the original equipment manufacturer's replacement hose.
- In order to make the tester more user friendly: In the event that the tester can not be easily placed next to the filler neck adapter of the vehicle being tested, the hose shall be a minimum of 15 feet. If the tester can easily be placed near the filler neck adapter, the hose shall be a minimum of 3 feet. Other designs require BAR approval on a case-by-case basis.
- Connector - The tester hose to the fuel tank filler neck adapter quick-disconnect coupler shall be non-standard and capable of withstanding 5,000 low-pressure test cycles with no leaks. The coupler material shall be impermeable to all commercially available gasoline blends.
- The connection from the tester to the external nitrogen or compressed air source shall quick disconnect for ease of use.

3.10.2. Electrical Connectors and Power Requirements

3.10.2.1. Electrical Connectors

- If the RS-232 port is not used as the power source connection, then the tester shall be equipped with one low-voltage power outlet that is recessed and protected from damage.
- The tester shall include at least one female DB9 port with full hardware and software support.

3.10.2.2. Power Requirements without EIS Communications – The tester shall operate on 12 volts using a maximum of 0.5 amps. The manufacturer shall provide a 110VAC wall-pack transformer and connector, or rechargeable battery option, for the tester until such time as the tester is integrated with the EIS.

3.10.2.3. Power Requirements with EIS Communications – With the tester connected to and communicating with the EIS, the tester shall be powered by a 12 VDC source limited to 0.5 amps supplied by the RS-232 communications port.

3.10.3. Physical Requirements

- The tester shall weigh 8 pounds maximum, not including adaptors and air supply hose.
- The tester shall be easy to use and maintain.
- If the tester is designed to be hand held, the tester shall withstand a drop of 36" to a concrete floor, without damage or loss of functionality.
- If the tester is designed to be permanently affixed to a movable cart, the tester, and attached components on the cart, shall be able to withstand the impact from tipping over of the cart, without damage or loss of functionality.

4. SOFTWARE REQUIREMENTS AND COMMUNICATION PROTOCOL

4.1. OVERVIEW – Section 4 specifies the software requirements for the tester. It includes test procedures, sequences, decisions, responses, and prompts as well as necessary information to be loaded, security issues, lockouts, file structures, etc. Actual prompt wording may vary from the examples, as long as the intent is unchanged.

4.2. SOFTWARE COMPONENTS

4.2.1. General - The program software used in the tester shall consist of a process control system as well as fuel behavior prediction. The software consists of inspection test procedures and criteria, security measures, utilities, and ancillary modules. Its features include tester temperature measurement, pressure measurements, PASS/FAIL determinations, calibration procedures, and interface with the Emissions Inspection Systems (BAR-97). In addition, the software shall write test results and calibration results to a record. It shall be the responsibility of the manufactures to stay current with software updates, including any additional testing to further develop compensation algorithms, in order to accommodate any changes in California fuels.

4.2.2. Pursuant to Health and Safety Code §44036, manufacturers are allowed six months from the date BAR issues its proposed specifications for periodic software updates, to obtain approval that the updates meet the proposed specifications and to install the updates in all tester units. During the first 30 days of the six-month period, the manufacturers shall be permitted to review and comment upon the proposed specifications. A manufacturer's failure to furnish or install software updates as so specified shall be cause for the BAR to decertify the manufacturer's tester or to issue a citation for civil penalty up to $1,000 per day that the manufacturer fails to furnish or install the software updates by the specific period.

4.2.3. Boot-Up Configuration – On each POWER-ON, the tester shall automatically self-diagnose all systems including memory checking and air/nitrogen inlet pressures. Upon satisfactory completion of the boot sequence, the application software shall display the Main Menu of available tester operations. All offered features shall be menu driven.

4.2.4. Software Modifications and Update Certification – Periodic software updates may be necessary. The BAR or the manufacturer may require software updates. In either case, the manufacturer is responsible for installing the software in its respective testers throughout the state. The cost of the software update is the responsibility of the tester owner if the update is required by BAR, and is the responsibility of the manufacturer if the manufacturer requires the update.

4.2.4.1. The BAR will provide updates to the software specifications as addenda detailing the individual software changes to the manufacturers. The manufacturers shall provide the software code to the BAR for each update. The software version number shall be displayed on the tester screen in the Quality Assurance Inspector (Q/A) mode and in each test record. The version number shall consist of a four digit numeric code, composed of the last two digits of the year, followed by a two-digit version number.

4.2.4.2. All software updates shall cause the software version number to change. There will be a separate field in the test record indicating the software version number currently in use.

4.2.4.3. The following criteria apply to software updates:

- Only BAR-approved software shall be used in the tester.
- All proposed software updates must be thoroughly tested by the manufacturer before being submitted to the BAR. Update disks as well as electronically transmitted updates shall be encrypted in a manner approved by BAR.
- All submitted updates, including manufacturer-generated updates, must be submitted to BAR for testing and approval and must be accompanied by a cover letter describing the changes contained in the software, and a description of reason for the changes, with an installation time line showing the number of units and the expected completion date.
- Software changes must correct all previously identified problems, and is subject to BAR approval.

4.3. RUNNING CHANGES AND OTHER SOFTWARE MODIFICATIONS – Any change to design characteristics, component specifications, and any modifications to the software must be approved by BAR prior to implementation. It will be the manufacturer's responsibility to confirm that such changes have no detrimental effect on the performance of the tester and shall also certify that the software complies with the specification.

4.4. MAIN MENU – On tester boot-up, the tester shall display the Main Menu after completing any necessary system checks. The Main Menu shall display the following options:

- Fuel Evaporative Test
- Manual Mode
- Calibration
- Communication / Upload
- Status Page

4.5. EVAPORATIVE SYSTEM TEST – Upon selection of *Fuel Evaporative Test* from Main Menu, the following sequence shall be performed (Note: when the EVAP tester is integrated with the EIS, the EIS shall prompt for all necessary data entry information.)

4.5.1. The screen shall display the following prompt:

DISPLAY PROMPT:

SELF TEST – PLEASE WAIT.

4.5.1.1. The EVAP tester shall check the PRESSCONFIG.DAT for pending software updates. If an update is required, the EVAP tester shall perform the software update before proceeding. If a software update is not required the EVAP tester shall proceed with the self-test.

4.5.2. The software will then check to verify that the calibration period has not expired and the tester is not locked out for any other reason.

4.5.2.1. If the calibration period has expired or any lockouts exist, the software shall display the following prompt until the user presses any key to continue:

DISPLAY PROMPT:

CALIBRATION REQUIRED

or

XXXX LOCKOUT (XXXX is the appropriate lockout in this case)

4.5.2.2. Checks for upload lockouts

4.5.2.2.1. If the number of records which have not been uploaded on the tester exceeds "ALLOWED TESTS BEFORE UPLOAD LOCKOUT" in PRESSCONFIG.DAT or the time since last upload of files exceeds "ALLOWED TIME BEFORE UPLOAD LOCKOUT" in PRESSCONFIG.DAT, the software shall display the following prompt until the user presses any key to continue:

DISPLAY PROMPT:

DATA UPLOAD REQUIRED

4.5.2.3. If the tester is locked out because service is required, the software shall display the following prompt until the user presses any key to continue:

DISPLAY PROMPT:

LOCKED OUT – CALL SERVICE

4.5.3. If the calibration is current and there are no lockouts, then the software shall begin a self-test procedure to verify proper testing conditions which include the following:

4.5.3.1. Tester's pressure sensors are within the expected range, as determined by the manufacturer. If the sensors fall outside the manufacturer's expected range, then the tester shall display the following prompt:

DISPLAY PROMPT:

SENSOR ERROR – CALL SERVICE.

The software shall return to the Main Menu and set a lockout.

4.5.3.2. Tester inlet pressure is within the expected range, as determined by the manufacturer. If the pressure falls outside the manufacturer's expected range, then the tester shall display the following prompt:

DISPLAY PROMPT:

INLET PRESSURE ERROR – CHECK INLET SUPPLY LINE.

PRESS ANY KEY TO RETRY.

4.5.3.3. If the tester fails the self-test for the fifth consecutive time, the tester shall display the following prompt until the user presses any key to continue:

DISPLAY PROMPT:

INLET PRESSURE ERROR, RE-ADJUST OR CALL SERVICE

4.5.3.4. Tester's temperature sensors are within the expected range, as determined by the manufacturer. If the temperature sensors fall outside the expected range, then the tester shall display the following prompt until the user presses any key to continue:

DISPLAY PROMPT:

TEMPERATURE SENSOR ERROR – CALL SERVICE.

4.5.4. Upon successful completion of the self test, the tester shall continue with the following test procedure:

4.5.4.1. If the number of records which have not been uploaded on the tester exceeds "ALLOWED TESTS BEFORE UPLOAD WARNING" in PRESSCONFIG.DAT or the time since last upload of files exceeds "ALLOWED TIME BEFORE UPLOAD WARNING" in PRESSCONFIG.DAT, the software shall display the following prompt until the user presses any key to continue:

DISPLAY PROMPT:

DATA UPLOAD REQUIRED SOON, UPLOAD AFTER THIS TEST

4.5.4.2. The software shall prompt for the last four characters of the VIN.

DISPLAY PROMPT:

ENTER LAST 4 CHARACTERS OF VIN (if a character is not numeric, and the tester is not capable of alpha entry, enter a "#" in the appropriate position, any tester button may be used for the "#" as long as it is documented in the instructions).

4.5.4.3. The software shall display the following prompt:

DISPLAY PROMPT:

DOES THE VEHICLE HAVE DUAL TANKS? (YES/NO)

4.5.4.4. The software shall display the following prompt:

DISPLAY PROMPT:

IS EVAP. SYSTEM MISSING(1), MODIFIED(2), DISCONNECTED(3), or NO?

4.5.4.4.1. If 4.5.4.3 was answered YES, the software shall create a test record and exit to the Main Menu after displaying the following prompt until the user presses any key to continue:

DISPLAY PROMPT:

MULTI TANKS ARE NOT TESTED. TEST COMPLETE.

4.5.4.4.2. If 1, 2, or 3, the software shall create a test record. When the test record is written, the appropriate code from the Error code table (Section 11.0) shall be entered into the test record 'Error (abort) code' field. The software shall and exit to the Main Menu after displaying the following prompt until the user presses any key to continue:

DISPLAY PROMPT:

VEHICLE EVAP. SYSTEM IS NOT INTACT. TEST ABORTED.

4.5.4.5. The software shall prompt for the filler neck adapter, the appropriate color code shall be entered in the
test record.

DISPLAY PROMPT:

SELECT FILLER NECK ADAPTER: BLACK, BLUE, RED, UNIVERSAL, OTHER.

4.5.4.6. The software shall prompt the technician to start the EVAP test.

DISPLAY PROMPT:

CRIMP/PLUG CANISTER HOSE, CONNECT TO TANK, PRESS START.

4.5.4.7. The tester will wait for the technician's input.

The software shall generate a test record after the 'start button' has been pressed.

4.5.5. After the tester receives the "begin test" input, the tester shall pressurize the fuel tank, note the corrected amount of air or N_2 added, and write these values to the test record.

DISPLAY PROMPT:

TESTING

4.5.6. During the EVAP test, the software shall determine if the tank can be pressurized appropriately. A gross leak shall be indicated if the fuel tank cannot be pressurized to an appropriate pressure or, a leak greater than the upper testable limit of 0.050 plus the tolerance at this size 0.010 = 0.060. Note: prior to displaying results, the software shall write all the appropriate test results to the test record (date, temperature, leak size, vapor space, number of attempts, maximum test pressure, etc.).

4.5.6.1. If a gross leak is detected, or if the fill time has been exceeded a "999" fill shall be written to the leak size field. If gross leak is detected, a "G" shall be entered in appropriate sections of the 'Test Record'. Skip to 4.5.6.2.1 Seal Verification Check (SVC). The tester will display the following prompt:

DISPLAY PROMPT:

TEST FAILED (GROSS LEAK)

4.5.6.2. If the EVAP tester is able to pressurize the tank, but the test fails, the software shall display the following prompt and shall enter a "F" in the appropriate fields of the 'Test Record':

DISPLAY PROMPT:

TEST FAILED
LEAK SIZE ~ .XXX
CUTPOINT IS .XXX

4.5.6.2.1. The Seal Verification Check may be run only once per test. This step shall be skipped if a retest was preformed, and Section 4.5.6.2 shall be applied as if the tank was pressurized. The software shall display the following prompt:

DISPLAY PROMPT:

CHECK FOR PROPER SEAL. PRESS ANY KEY TO CONTINUE

The LPFET shall pressurize to 14 inches of water for up to 5 minutes or until canceled by user.

DISPLAY PROMPT:

WERE CONNECTIONS/PLIERS/PLUGS LEAKING? (YES/NO)

If yes, the software shall repeat the test sequence again (starting from Section 4.5.6 above).

If no, the test is complete and the software shall then return to the Main Menu.

DISPLAY PROMPT:

CONTINUE WITH VERIFICATION TEST? (YES/NO)

4.5.6.3. If the EVAP test passed, display the following prompt and enter a “P” in the appropriate fields of the ‘Test Record’:

DISPLAY PROMPT:

TEST PASSED
LEAK SIZE ~ .XXX
CUTPOINT IS .XXX

4.5.6.4. The software shall display the following prompt:

DISPLAY PROMPT:

REMOVE PLIERS, DISCONNECT TESTER. PRESS ANY KEY TO CONTINUE.

4.5.7. At anytime during the test sequence, the test may be aborted by the activation of an abort button. The abort button shall cause the tester to immediately open the system purge valve, write the Tech Abort code to the Error field of the Test Record, and subsequently return the tester to the Main Menu.

4.5.8. If at anytime during the test procedure the fuel tank pressure exceeds 28" of H_2O, the tester shall automatically abort the evaporative test, open the pressure vent, and display the following prompt:

DISPLAY PROMPT:

SYSTEM OVERPRESSURE. TEST ABORTED. DISCONNECT TESTER

The tester will then lock out the Fuel Evaporative Test and the Manual Mode test until a successful calibration has been completed.

The software shall write "Overpressure Abort" code to the Error field of the Test Record.

4.6. MANUAL MODE –Upon selection of the *Manual Mode* from the Main Menu, the following sequence shall be performed:

4.6.1. The screen shall display the following prompt:

DISPLAY PROMPT:

PRESS START TO BEGIN MANUAL MODE.

4.6.2. After the technician presses the start button, the tester shall display the following prompt:

DISPLAY PROMPT:

CONNECT TO TANK. SEAL EVAP SYSTEM. PRESS START.

When the technician presses the start button, the tester shall pressurize the fuel tank to 14" of H_2O and maintain that pressure for no more than 10 minutes. While in the Manual Mode operation, the tester shall display the following prompt:

DISPLAY PROMPT:

MANUAL MODE. TIME REMAINING: XX

The XX represents the time remaining on the 10-minute clock and shall count down as the time elapses.

If the technician presses the start button prior to the expiration of the 10-minute time limit,

the tester shall restart the 10-minute timer and continue to pressurize the fuel evaporative system.

4.6.3. At the end of the 10-minute period, the tester will vent any remaining tank pressure, display the following prompt:

DISPLAY PROMPT:

TEST COMPLETE. UNSEAL EVAP SYSTEM. DISCONNECT TESTER

The software shall return to the Main Menu.

4.6.4. If at anytime during the Manual Mode sequence the testing pressure applied to the fuel tank exceeds 28" of H_2O gauge, the tester shall automatically abort the manual operation, open the pressure vent, and display the following prompt:

DISPLAY PROMPT:

SYSTEM OVERPRESSURE. TEST ABORTED. UNSEAL EVAP SYSTEM. DISCONNECT TESTER

The tester shall return to the Main Menu.

4.6.5. During the Manual Mode sequence, the tester shall not abort on the initial detection of a "gross leak." The tester shall make the user aware of the presence of a "gross leak" and start a timer. If the timer exceeds 30 seconds, the tester shall abort the Manual Mode sequence, and display the following prompt:

DISPLAY PROMPT:

GROSS LEAK DETECTED. MANUAL MODE ABORTED.

4.7. CALIBRATION – Upon selecting the *Calibration* menu, the tester shall enter into an automated calibration sequence that determines whether or not the tester accuracy is within the manufacturer/BAR tolerances to perform the testing procedure. The calibration process shall consist of three tests performed by the tester and prompt the technician to connect various devices during the process. Upon selection of the *Calibration* function from the Main Menu, the following sequence shall be performed:

4.7.1. The tester shall display the following prompt:

DISPLAY PROMPT:

CONNECT CALIBRATION TANK. TURN CAL. LEAK SWITCH TO OFF. PRESS START.

4.7.2. The calibration procedure shall be initiated by pressing the start button, after which the tester will display the following prompt:

DISPLAY PROMPT:

LEAK CHECK IN PROGRESS.

4.7.3. The tester shall then test for system leaks by pressurizing the tester's internal plumbing, tester to tank hose, calibration tank, and calibration standard (in the "off" position) to approximately 14" H_2O and then turn off the supply air or nitrogen source. The internal pressure sensor shall monitor the internal pressure decay.

4.7.4. If the system pressure decay exceeds 1" H_2O within 60 seconds, then the tester shall FAIL Phase One of the calibration test and display the following prompt:

DISPLAY PROMPT:

LEAK CHECK FAILED.

The tester shall vent any remaining pressure in the system to the atmosphere and the software shall lock out the tester and prevent it from entering either the Fuel Evaporative Test or Manual Mode until the Accuracy Check procedure has been successfully completed. The software shall write the pressure drop, from the initial pressure, after 60 seconds or at the time of failure in the 'No Leak Result' field and write an "F" in the 'Calibration Pass/Fail Result' field of the calibration record. The tester shall then display the previous prompt until the user presses any key to continue.

4.7.5. If the tester successfully completes Phase One of the calibration procedure then the software shall write the pressure drop, from the initial pressure, after 60 seconds in the 'No Leak Result' field of the calibration record. The tester shall then proceed to Phase Two of the calibration procedure by displaying the following prompt:

DISPLAY PROMPT:

PERFORMING VAPOR SPACE CHECK.

4.7.6. While compensating for temperature, the tester shall pressurize the calibration tank to 14" H_2O gauge. Using the methodology adopted by the manufacturer, the tester shall determine the corrected amount of air or N_2 added to the test tank. The tester shall make this determination within +/- .5 gallon.

4.7.7. If the tester fails Phase Two of the calibration procedure, the tester shall vent any remaining pressure in the system to the atmosphere and the software shall lock out the tester and prevent it from performing either a Fuel Evaporative Test or Manual Mode testing until the tester successfully passes the calibration procedure. The software shall write the measured volume in the 'Volume Result' field and write an "F" in the

'Calibration Pass / Fail Result' field of the calibration record. The tester shall display the following prompt until the user presses any key to continue.

DISPLAY PROMPT:

VAPOR SPACE CALCULATION FAILURE. DISCONNECT TESTER FROM CAL. TANK.

4.7.8. If the tester successfully completes Phase Two of the calibration procedure then the software shall write the measured volume in the 'Volume Result' field of the calibration record. The software shall then proceed to Phase Three of the calibration procedure and display the following prompt:

DISPLAY PROMPT:

SELECT LOW LEAK. PRESS START.

4.7.9. Using an abbreviated testing procedure, the tester shall test the calibration tank with low leak. Once test is complete the software shall write "P" or "F" in the 'Low Leak Result' field and the measured leak rate in the 'Low Leak Rate' field of the calibration test record. The tester shall display the following prompt:

DISPLAY PROMPT:

SELECT HIGH LEAK. PRESS START.

4.7.10. Using the abbreviated testing procedure, the tester shall test the calibration tank with high leak. Once test is complete the software shall write "P" or "F" in the 'High Leak Result' field and the measured leak rate in the 'High Leak Rate' field of the calibration test record.

4.7.11. Once the tester identifies the overall PASS/FAIL determination of the calibration, the tester shall display the following appropriate prompt until the user presses any key to continue.

DISPLAY PROMPT:

TESTER CALIBRATION FAILED. DISCONNECT TESTER

DISPLAY PROMPT:

CALIBRATION PASSED. DISCONNECT TESTER

4.7.12. Upon a successful completion of the calibration procedure, the software shall write the appropriate "P" or "F" in the 'Calibration Pass / Fail Result' field of the calibration test record including the date, time, and start the 72 hour clock to count down to the next calibration due date and time. The data required in the calibration record are detailed in (Section 10).

4.7.12.1. To calculate the next time due, the software shall add 72 hours to the current calibration date and time.

4.7.13. If the EVAP tester fails more sequential calibrations than the number listed in 'allowed calibrations before lockout' in PRESSCONFIG.DAT, the software shall lock out the user from performing any subsequent tests and display the following prompt:

DISPLAY PROMPT:

TESTER CALIBRATION MULTIPLE FAILURE LOCKOUT – CALL SERVICE

4.8. COMMUNICATIONS MENU – The communications menu will have an option to initiate a dial out to a server/laptop to upload files and any additional communication items required by the manufacturer (requires BAR approval). Entry of the dial-out number and any required set-up (such as dialing a prefix for dial-out) shall be accessible by the technician.

The communications sub-menus shall contain the following:

4.8.1. INITIATE RECORD UPLOAD – If this option is chosen the device shall prompt the user to connect the device to a phone line, and shall then initiate a call. The device shall display a prompt:

DISPLAY PROMPT:

CONNECT PHONE LINE/CABLE – PRESS ENTER

Once "enter" is pressed, the device shall connect to the remote computer automatically, and then upload all test and calibration records that have not previously been uploaded. The records shall not be deleted from memory. The tester shall also upload the current lockout status. The EVAP tester shall be able to receive configuration tables, updated software, and updated lockout status. Anytime the EVAP tester is connected to the Data Depot, the Data Depot shall update the date/time on the EVAP tester.

4.8.2. Optional –A menu item may be incorporated to enable an "answer" mode, in which the tester waits for an external call to upload its files. Alternatively, this feature may be enabled automatically whenever the tester is idle.

4.8.3. CHANGE PHONE NUMBER – If this option is chosen the device shall prompt the user for the new phone number.

4.9. STATUS PAGE – The status page shall be listed under the Main Menu and shall display the following information:

- Station License Number
- Tester Number
- Date/Time

- Loaded Software Version Number
- Update Software Version Number
- Next calibration date
- # of tests/days before upload lockout
- Clock error
- Sensor failure (on boot-up)
- QA/State tester lockout
- Calibration failure / Calibration required
- Exceeded number of tests or days since last upload
- Upload data frequency
- Other (display reason)

4.10. Q/A LAPTOP SOFTWARE REQUIREMENTS

4.10.1.1. When EVAP tester is connected to a laptop, the laptop software shall require the correct Q/A access code (same as BAR97 code) to be entered prior to allowing laptop software to be accessed.

4.10.1.2. The Q/A laptop software shall perform as an "offline Data Depot." The software shall cover all functionality outlined in "Table 1 – command list" of the "Confidential Interface Protocol" specification. This functionality will include, but is not limited to the following:

- Uploading of all/any data on tester without modification of any data status flags.
- Uploading of all/any data on tester with modification of data status flags.
- Intuitive GUI for data file copy/move to external storage device. (thumb drive, LAN, email, etc.)
- If records are stored in a flat file, carriage return and line feed shall terminate each record for ease of viewing. If records are saved in a database structure, carriage return and line feed are not required.
- A menu item for date/time synchronization.
- Update Configuration Tables
- Load Software Update
- Upload Test Records
- Upload Calibration Records
- Enter Station License Number
- Lock/Unlock Tester (all lockouts can be cleared)

4.10.1.3. When the Update Configuration Tables option is selected, the software shall update the PRESSCONFIG.DAT file as necessary to improve accuracy or compliance with the Fuel Evaporative Tester Specification. The revised PRESSCONFIG.DAT file will not be made active until the "CONFIGURATION FILE ACTIVATION DATE" in the new PRESSCONFIG.DAT is reached.

4.10.1.4. When the Load Software Update option is selected, the laptop computer shall communicate with the tester to load an updated software version into the tester memory for activation at a later date as determined by the "NEW SOFTWARE ACTIVATION DATE" field in PRESSCONFIG.DAT.

4.10.1.5. When the Upload Test Records option is selected, the laptop shall access the Test record and upload all records to the laptop computer. The uploaded data shall be stored in a unique file on the laptop. The process shall not delete any records from the tester. The test record file shall be named with the Tester Serial Number, Year, Month, Day, Hour, Minute, Second, Test Record designator (AACCCCCCyyyymmdd_hhmmssT).

4.10.1.6. When the Upload Calibration Records option is selected, the laptop shall access the calibration records and upload all records to the laptop computer. The uploaded data shall be stored in a unique file on the laptop. The process shall not delete any records from the tester. The calibration record file shall be named with the Tester Serial Number, Year, Month, Day, Hour, Minute, Second, Calibration Record designator (AACCCCCCyyyymmdd_hhmmssC).

4.10.1.7. When the Lock/Unlock Tester option is selected, the laptop computer shall send a lockout code to the tester that prevents the tester from performing any Fuel Evaporative Tests. This option shall be used by BAR's Q/A or Enforcement personnel.

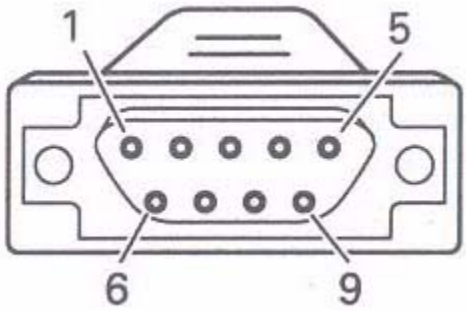
4.10.1.8. The Q/A software shall be developed using Microsoft® Visual Studio .NET 2002 or newer, for Microsoft® Windows 2000 or equivalent windows operating system upgrade. The Q/A software, source code (Microsoft® Visual Studio Project folder with all files needed to compile), software logic and data flow documentation shall be supplied to and become the property of BAR at time of certification.

4.11. EIS COMMUNICATIONS

Due to the sensitive nature of the EIS communications protocol, this section is classified as confidential and will only be supplied to manufacturers on request after BAR receives a signed agreement of confidentiality. Manufacturers are responsible for maintaining communications per the current protocol document.

4.11.1. The connector pin assignments on the EVAP tester DB9 connector are as follows (the connector on the EVAP tester is female and set up as DTE):

Pin 1 – Data Carrier Detect
Pin 2 – Received Data
Pin 3 – Transmitted Data
Pin 4 – Data Terminal Ready
Pin 5 – Signal Ground
Pin 6 – Data Set Ready
Pin 7 – Request to Send
Pin 8 – Clear to Send
Pin 9 – Ring Indicator/Power



5. CERTIFICATION

5.1. CERTIFICATION CRITERIA

5.1.1. Each manufacturer shall submit 3 production units for evaluation and certification with all accessories as described in Section 3.9, including the Q/A laptop application as described in 4.10. Upon submission, the application and all required documentation become the property of the Bureau of Automotive Repair. In addition, at least one tester shall remain with BAR to conduct further testing as the need arises and the manufacturer shall maintain all hardware and software updates as appropriate.

5.1.2. All submitted testing units shall pass BAR certification testing to determine compliance with this specification.

5.1.3. Upon successful conclusion of laboratory testing, beta testing, and data evaluation, BAR will certify tester units that meet these Low Pressure Fuel Evaporative Tester Performance Specifications.

5.2. CERTIFICATION SUBMITTAL PACKAGE

5.2.1. The BAR will treat the submittal package and its contents as confidential.

5.2.2. The submittal package shall contain the following documentation.

- Application for LPFET certification – Attachment
- LPFET Certification submittal checklist – Attachment
- Fuel Evaporative Pressure Tester description, including diagrams, parts and price lists, and a discussion of the theory of operation.

- Specifications - Submit performance, mechanical, power, weight and dimensional specifications for each model, model #, Software/Firmware version #.
- Schematics and Photographs - Detailed mechanical, electrical drawings and schematics shall be submitted of the entire tester and its components, if applicable. Color 8 x 10 photographs of the tester, enclosures, nameplates, sensors, displays, controls, and calibration instruction plates shall be provided in the package.
- Software documentation as described in Section 5.3.
- A detailed explanation of the PASS/FAIL, equivalent leak size, and apparent tank size determinations. This shall include any flow charts, lookup tables, formulas, and other data/items used to calculate the PASS/FAIL, equivalent leak size, and apparent tank size during a test.
- Instruction Manual as described in Section 3.9.1.7.
- Copy of warranty, service, repair documents
- Detailed documentation on the functional operation of the Data Depot.
- Manufacturer's certification test reports that verify tester compliance with Section 6.

5.3. SOFTWARE DOCUMENTATION

5.3.1. The tester software shall be fully documented. One copy of each of the documents listed below shall be submitted to BAR unless otherwise instructed.

- Complete program listings, including the source code as well as the object code, in electronic form, shall be provided upon request. BAR does not require these documents to be submitted with the application for certification.
- Functional specifications.
- Functional flow charts of the manufacturer's software routines and subroutines. These flow diagrams shall include decision points and decision/timing criteria so that the logic of the programming can be correlated, where applicable, to the specification.
- Sample inputs and outputs for all processes.
- Detailed interface information on the pressure measurement devices including the identification of protocol and output specifications.
- All operating system files layouts with file names, file type, and file security.

5.4. CHANGES TO TEST REQUIREMENTS

The BAR may, at its discretion, add, modify or delete certain tests and/or documentation requirements. Any changes will be based on such factors as questionable validity, excessive cost, implementation problems, or unforeseen problems with the tester, equipment or procedures. Manufacturers will be notified and, if necessary, requested to run the modified tests at their testing facility.

6. PERFORMANCE CRITERIA

All testers submitted to BAR shall be subjected to testing to ensure that the candidate tester meets the following performance criteria. All testers submitted to BAR shall be subjected to testing and shall complete all certification tests without failure with the exception of durability testing (i.e., accelerated failure mode testing).

6.1. ACCURACY/REPEATIBILITY - Each tester shall be tested for pressure loss and accuracy between 20 and 120 degrees F. The testers will be evaluated with a variety of commercially available gasoline fuel blends.

6.1.1. Leak Down - The tester's maximum leak down shall not exceed 0.5" H_2O in 10 minutes.

6.1.2. Pressure Accuracy – The tester shall be capable of measuring the pressure in a clean dry tank during a test, with a pressure deviation that shall not exceed 5% of BAR measured pressure as illustrated in the following mathematical equation:

$$Pd = \frac{Pm - Pt}{Pt} \times 100$$

where:
Pd = Relative pressure deviation, in percent
Pt = Test pressure
Pm = Measured pressure

The pressure deviation shall be measured while tank pressures are between 5 - 20 inches H_2O. The tester shall output the measured pressure with latency less than 1 second from the collection of a BAR measured reading. The manufacturer shall supply software/output for electronic collection of pressure readings during a test, at the time of certification testing. The "Maximum Test Pressure" as recorded in Field 17 of the Test Record (Section 9) shall correspond with BAR measured pressure.

6.1.3. Inlet Pressure Accuracy Effect – The tester shall meet Section 3.2 accuracy requirements with the inlet pressure set anywhere in the 25 to 35psi range.

6.1.4. Leak Measurement Accuracy – The tester shall measure and record a range of leak sizes per (Section 3.2.4). The actual leak shall be measured and recorded per accuracy limits specified in (Section 3.2.5).

6.1.5. Leak Measurement Accuracy – The tester shall measure leak sizes within repeatability limits as specified in (Section 3.3.1).

6.2. COMMUNICATION PROTOCOL TESTING – The manufacturer shall provide BAR with software that emulates communications with the EIS. Using a laptop computer and the emulation software, the candidate's tester shall comply with the requirements set forth in confidential Communication Protocol section of the specification. In addition, the manufacturer shall provide BAR with software as required in Section 2.3. Each procedure shall be performed eight times to ensure accuracy and consistency.

6.3. PINCH PLIERS – The pinch pliers shall be tested to ensure they prevent fuel vapor, air, or nitrogen from flowing through hoses normally used in the automotive fuel evaporative system.

6.4. FIELD BETA TESTING – After successfully completing engineering laboratory certification testing, BAR shall provide written authorization for the manufacturer to proceed with the beta testing. The manufacturers shall demonstrate that candidate systems, software, and components meet these specifications while operating in an actual automotive shop environment. Manufacturers must demonstrate that the equipment continuously and correctly operates to BAR's satisfaction during the entire beta testing process. The beta test stations must be approved by BAR in advance and must agree to participate in the beta process. Station personnel shall be trained to conduct the normal maintenance and calibrations. Beta testers shall be audited with 0.000, 0.020 and 0.040 standards attached to the 2-gallon tank and shall measure the leak size within accuracy limits in Section 3.2.4. Ninety-nine percent (99%) of the audits shall meet these criteria.

6.4.1. The first stage of beta testing consists of ten (10) units, per manufacturer, being placed in the field and the collection of at least 1,000 valid records total, while operating properly for a minimum of two weeks. Upon successful completion of Stage One, BAR shall provide written authorization to the manufacturers to proceed with Stage Two of the beta testing. This testing will be conducted at high volume inspection stations that have been approved by BAR.

6.4.1.1. Successful completion of Stage One requires that all ten units perform to BAR's satisfaction for the duration of the testing

6.4.1.2. If more than one tester fails to complete Stage One, then the manufacturer will be required to determine the cause of failure. BAR reserves the right to discontinue beta testing if any of the devices fail to meet the LPFET specification.

6.4.1.3. During Phase One of the beta testing, manufacturers shall provide field support and conduct weekly audits of the testers. The manufacturers shall submit the weekly audit results to BAR. The weekly audit shall include an electronic copy of all test and calibration records that have been verified (without modification) as good records, by the manufacturer.

6.4.2. Stage Two beta testing increases the number of units to no less than 20, per manufacturer, being placed in the field and the collection of at least 2,000 valid records total, while operating properly for a period of up to eight weeks. This testing will be conducted at high volume inspection stations that have been approved by BAR.

6.4.2.1. Successful completion of Stage Two requires that at least 95% of the testers subjected to Stage Two of the beta testing complete the beta test period with no failures.

6.4.2.2. During Phase Two of the beta testing, manufacturers shall provide field support and conduct bi-weekly audits of the testers. The manufacturers shall submit the bi-weekly audit results to BAR. The audit shall consist of an electronic copy of all test

and calibration records that have been verified (without modification) as good records, by the manufacturer. These records shall be sent to BAR from the Data Depot in the same manner as after implementation of LPFET testing.

6.4.2.3. During beta testing BAR reserves the right to randomly sample up to three testers from the field per week, and evaluate their performance in a manner similar to certification testing. In this case, the corresponding manufacturer shall provide a loaner unit to the Smog Check station during the evaluation period.

7. WARRANTY, SERVICE, AND IN-USE PERFORMANCE

7.1. WARRANTY

7.1.1. The manufacturer shall provide a warranty to the purchaser for the low-pressure fuel evaporative tester and all accessories for at least one (1) year covering any and all defects in materials, software, and workmanship. The Warranty shall start upon the equipment delivery date, or program start date, whichever is later. The intent is to cover the unit under warranty for the first year of program operation. B.A.R. shall review and approve original warranty language and any future changes to warranty language.

7.1.2. All equipment and test procedure related problems shall be the responsibility of the equipment manufacturer for 1 year. If any problems or discrepancies are discovered within the warranty period, the manufacturer shall correct or resolve the issue to the satisfaction of the B.A.R. and in a time frame acceptable to the B.A.R. Failure to correct within the B.A.R. specified time frame, or in a manner satisfactory to B.A.R., will result in punitive actions, including but not limited to those set forth in the California Code of Regulations and Section 44036 of the Health and Safety Code.

7.1.2.1. Where equipment related, the device shall be repaired or replaced.

7.1.2.2. Where procedural related, the test procedure and or vehicle non-testable list shall be corrected.

7.1.2.3. Where software related, the software shall be corrected.

7.1.3. A copy of the warranty shall be included with each tester.

7.1.4. If an extended warranty is offered, costs, terms, and conditions shall be documented, signed by both the manufacturer and technician, with hardcopy filed by both parties.

7.1.5. In the event that the equipment fails to comply with any of the items listed above (Sections 7.1.1-7.1.4) the customer shall be entitled to a full purchase price refund for a period of 1 year from equipment purchase date or program start date, which ever is greater.

7.2. SERVICE

7.2.1. A list of statewide service locations with addresses and phone numbers shall be included with each tester.

7.2.2. A replacement tester shall be delivered or received by shipment, to the technician within 3 days of service call.

7.2.3. A toll free number shall be provided for support and service, available during 8am – 5pm Monday through Friday, Pacific Standard Time.

7.2.4. A repair, maintenance, and replacement price sheet shall be included with each tester.

7.2.5. A repair estimate shall be given unless the technician has selected a priced repair/service from the cost sheet.

7.3. IN-USE PERFORMANCE

7.3.1. To ensure the EVAP units remain in a certified configuration B.A.R. may select in-use units for evaluation and testing at B.A.R. In this case, the corresponding manufacturer shall provide a loaner unit to the Smog Check station during the evaluation period.

8. DATA DEPOT

8.1. BAR shall have 24/7 access to the depot server for at least 10 users and be able to view/download all EVAP test data and configuration data from the server via a secure Internet connection.

8.2. BAR shall be able to download the EVAP data from the depot, in CSV text format, data tables, or by database transaction, as approved by BAR. If records are stored in a flat file, carriage return and line feed shall terminate each record for ease of viewing. If records are saved in a database structure, carriage return and line feed are not required.

8.3. Upon BAR command, the Data Depot shall send configuration files to individual EVAP testers, or all EVAP testers.

8.4. Upon BAR command, the Data Depot shall send different configuration files to different EVAP testers (there may be multiple versions of the configuration file).

8.5. Upon BAR command, the Data Depot shall send software updates to an individual EVAP tester or all EVAP testers.

8.6. The data at the Data Depot shall be available for BAR to view/download within one hour from the time an EVAP tester uploaded data to the server.

8.7. The Data Depot shall track the software versions of the EVAP testers in the field and verify that the EVAP testers have the correct version during each call. If an EVAP tester has an old software version, the Data Depot shall send the correct software version during the current call.

8.8. The Data Depot shall track the various table versions (PRESSCONFIG.DAT) during each call loaded on the EVAP testers and verify that the EVAP testers have the correct versions. If an EVAP tester has an old table version, the Data Depot shall send the correct table(s) during the current call.

8.9. The Data Depot shall be able to receive data from EVAP testers 24 hours a day / 7 days a week, and be fully functional 99.5% of the time.

8.10. Data Depot data from records shall be archived nightly. Archived records shall be accessible within 24 hours and shall be kept for 1 year from test date.

8.11. The technician will plug in and download records to the depot when prompted by the tester. The tester shall redial automatically when there is a busy signal. The tester shall require download at a B.A.R. specified time period or test record count.

8.12. Initial tester to depot dialing frequency shall be configured for whichever condition occurs first: once a week (5 day warning) or 25 records (20 record warning) during beta testing, once a day (1 day warning) or 25 records (20 record warning) during statewide program (up to 30 units – selected by BAR), and once a month (25 day warning) or 500 records (475 record warning) for the remaining units during the statewide program.

Until BAR specifies otherwise, as a default, complete PRESSCONFIG.DAT as follows:

- Beta testing: field 6 = 20, field 7 = 25, field 8 = 5, field 9 = 7
- Statewide implementation (30 unique units): field 6 = 20, field 7 = 25, field 8 = 1, field 9=1
- Statewide implementation: field 6 = 475, field 7 = 500, field 8 = 25, field 9 = 30

8.13. The Data Depot may be located anywhere in the United States.

8.14. Data upload calls shall be at no cost to stations for two years.

8.15. Manufacturer shall operate the Data Depot for two years from program start date. After such time B.A.R. shall take ownership of the Depot (including hardware and software). Bar will own but reserves the right to contract for continued contractor operation and maintenance of the depot. At the point BAR chooses to operate depot, the system shall be moved to BAR.

8.16. The Data Depot shall reset the date and time during every data upload. The clock shall have a battery backup feature. The Data Depot shall contact NIST (http://www.bldrdoc.gov/timefreq/index.html) and synchronize its time daily. The Data Depot won't actually "reset" the time and date during each upload. It will "send" the current time and date during each upload. The tank tester would be responsible for setting the time/date based on the information received from the Data Depot. (The "Time Sync" command defined in section 4.15 of the LPFET Interface Protocol will be used for this.)

8.17. The Data Depot shall receive and clear tester lockouts. The Data Depot shall set only the 'State Lockout' on the tester. Other lockouts are to be set by the tester or Q/A software only. (LPFET Interface Protocol 4.14)

8.18. The Data Depot shall utilize virus protection and security measures to prevent unauthorized access and/or corruption.

8.19. For each Manufacturer, their Data Depot shall be capable of processing all the Manufacturer's testers in the program within a 24 hour period. Manufacturers may propose a method for distribution of calls from the testers to minimize Data Depot hardware requirements. The manufacturer's proposed method is to be approved by BAR.

8.20. Manufacturers shall demonstrate the Data Depot before final tester certification. This demonstration shall verify that the Data Depot is capable of handling "worst case" call volumes without unreasonable impact to the Smog Check stations.

STATE OF CALIFORNIA - STATE AND CONSUMER SERVICES AGENCY **ARNOLD SCHWARZENEGGER, Governor**

BUREAU OF AUTOMOTIVE REPAIR
10240 SYSTEMS PARKWAY, SACRAMENTO, CA 95827
PHONE: (916) 255-3222

SUBMITTAL CHECK LIST FOR:

LOW PRESSURE FUEL EVAPORATIVE TESTER CERTIFICATION

Date Submitted: _____ Manufacturer: _____

Person Accepting Submittal: _____

	Received?	
Certification Submittal Package Item	**Yes**	**No**
Application for Certification		
Tester Description		
Diagrams		
Parts List / Price List		
Photographs		
Schematics		
Theory of Operation		
Specifications		
PASS/FAIL Decision Criteria		
Instruction Manual		
Warranty, Service, Repair Documents		
Data Depot Description		
Manufacturers Certification Test Report		

Business Status		
Company's Organizational Chart		
Financial and Business Information		
Proof of Insurance		
Corporate Evidence		
Audited Financial Statement or Equivalent		

Software Documentation		
Source Code		
Object Code		
Functional Specification		
Functional Flow Charts		
Sample of Inputs and Outputs		
Detailed Interface Information		
Detailed Data Depot/BAR Interface Information		
Operating System File Layouts		

After reviewing the submittal package provided by the manufacturer listed above, I have accepted the submittal package.

Accepted by: _____

Date: _____

or

Rejected the submittal package for the following reasons:

_____

_____

_____

_____

_____

_____

Rejected by: _____

Date: _____

BUREAU OF AUTOMOTIVE REPAIR
10240 SYSTEMS PARKWAY, SACRAMENTO, CA 95827
PHONE: (916) 255-3222

APPLICATION FOR:

LOW PRESSURE FUEL EVAPORATIVE TESTER CERTIFICATION

This application is formally submitted by the following manufacturer/system provider:

Firm: _____

Address: _____

_____

Name of primary contact person: _____

Title: _____

Telephone Number: _____

The following equipment is being submitted for Certification/Approval:

Type of equipment: _____

Model Number/Name: _____

The undersigned hereby certifies, to the best of his/her knowledge, that the above system submitted for certification testing and evaluation has been designed and tested in accordance with the Low Pressure Fuel Evaporative Tester Specifications and that it meets all of the requirements contained therein.

_____Date:_____
Signature of Corporate Officer, Partner of Owner